

# TECHNOLOGY 2004

## *Paper Abstract*

**Name :** Neville I. Marzwell , M.S. 198-219

**Position/Title:** Section Staff, Robotic Systems and Advanced Computer Technology

**Affiliation:** NASA/ Jet Propulsion Laboratory

**Address:** 4800 Oak Grove Drive  
Pasadena, California 91109-8099

**Phone Number (81 8) 354-6543      Fax Number: (81 8) 393-5007**

**Gov't Agency/Lab** The Subject Technology Was Developed By/For:  
NASA/ Jet Propulsion Laboratory  
California Institute of Technology

Contract No. (if applicable): NAS7-1 236

Paper Title: Development Of A Commercially Viable Modular Autonomous Robotic System For  
Converting Any Vehicle To Autonomous Control

Category: Robotics

Description (use additional sheet if necessary):

A Modular Autonomous Robotic System (MARS) is being developed to convert any vehicle to autonomous control. This effort is focused on producing a system that is commercially viable for routine autonomous patrolling of known, semi-structured environments. MARS will address existing and emerging robotic vehicle applications for indoor and outdoor environments, like environmental monitoring of chemical, petroleum refineries, hazardous waste and nuclear material disposal, airport and plant site security and surveillance, detection and elimination of mines and explosives, street and parking-lot sweeping, snow removal, refuge collection, farming/harvesting, warehouse shelves resupply, lawn mowing, mail/parcel delivery, and intra-facility transport applications.

The MARS design applies modern open system architecture design methods to provide a modular, scaleable, and reconfigurable design capable of a range of applications. A hierarchy of control methods are incorporated, including teleoperation, continuous guidpath following, periodic guidpath following, absolute autonomous navigation (GPS/INS), and relative autonomous navigation (with respect to naturally occurring landmarks). Modern sensors and integration techniques are used, including obstacle detection sensors, ultrasonic and IR sensors mounted on top of the front bumper, a microwave radar positioned in the front and center of the vehicle bumper to detect forward collisions at high speed, a differential Global Positioning System (GPS), Inertial Navigation System (INS), random access laser radar, and computer vision based video navigation system. The initial prototype developed is for controlling an All Terrain Vehicle (ATV) fitted with a suite of volatile hydrocarbon gas sensors for measuring and mapping gas and vapor levels around chemical and petroleum refineries and storage facilities.